What is claimed is:

1. A method for repairing a pattern using a laser comprising:

a step of using laser light emitted from a Q-switched mode-locked pulse laser as laser light to be applied for repair processing.

2. The method for repairing the pattern using the laser according to Claim 1, wherein a pulse width of said laser light to be applied for said repair processing is in a range of 10 picoseconds to 300 picoseconds.

3. A method for repairing a pattern using a laser comprising:

a step of slicing a single laser pulse or multi-laser pulses from a string of pulses making up laser light emitted from a Q-switched mode-locked pulse laser by using an optical modulator and using said laser light having said sliced single pulse or said sliced multi-laser pulses as laser light to be applied for repair processing.

4. The method for repairing the pattern using the laser according to Claim 3, wherein a pulse width of said laser light to be applied for said repair processing is in a range of 10 picoseconds to 300 picoseconds.

5. The method for repairing the pattern using the laser according to Claim 3, wherein the number of said multi-laser pulses

to be sliced from said laser light emitted from said Q-switched mode-locked pulse laser and time to start slicing said multi-laser pulses to obtain a first pulse are able to be set in an arbitrary manner.

6. A method for repairing a pattern using a laser comprising:

a step of slicing a single laser pulse or multi-laser pulses from a string of pulses making up laser light emitted from a Q-switched mode-locked pulse laser by using an optical modulator; and

a step of directly amplifying said laser light having said sliced single laser pulse or said sliced multi-laser pulses by using an optical amplifier and using said amplified laser light as laser light to be applied for repair processing.

7. The method for repairing the pattern using the laser according to Claim 6, wherein a pulse width of said laser light to be applied for said repair processing is in a range of 10 picoseconds to 300 picoseconds.

8. The method for repairing the pattern using the laser according to Claim 6, wherein the number of said multi-laser pulses to be sliced from said laser light emitted from said Q-switched mode-locked pulse laser and time to start slicing said multi-laser pulses to obtain a first pulse are able to be set in an arbitrary manner.

9. A method for repairing a pattern using a laser

comprising:

a step of slicing a single laser pulse or multi-laser pulses from a string of pulses making up laser light emitted from a Q-switched mode-locked pulse laser using an optical modulator; and

a step of multiplexing one laser light having a first laser pulse obtained by splitting said single laser pulse or said multi-laser pulses and an other laser light having a second laser pulse obtained by splitting said single laser pulse or said multi-laser pulses and by providing time delay to said second laser pulse into one laser light and using said multiplexed laser light as laser light to be applied for repair processing.

10. The method for repairing the pattern using the laser according to Claim 9, wherein a pulse width of said laser light to be applied for said repair processing is in a range of 10 picoseconds to 300 picoseconds.

11. The method for repairing the pattern using the laser according to Claim 10, wherein said time delay between said first laser pulse and said second laser pulse is in a range of 0.1 nanoseconds to 9 nanoseconds.

12. The method for repairing the pattern using the laser according to Claim 9, wherein the number of said multi-laser pulses to be sliced from said laser light emitted from said Q-switched mode-locked pulse laser and time to start slicing said multi-laser pulses to obtain a first pulse are able to be set in an arbitrary manner.

13. A method for repairing a pattern using a laser comprising:

a step of slicing a single laser pulse or multi-laser pulses from a string of pulses making up laser light emitted from a Q-switched mode-locked pulse laser using an optical modulator;

a step of multiplexing one laser light having a first laser pulse obtained by splitting said single laser pulse or said multi-laser pulses and an other laser light having a second laser pulse obtained by splitting said single laser pulse or said multi-laser pulses and by providing time delay to said second laser pulse into one laser light; and

a step of directly amplifying said multiplexed laser light by using an optical amplifier and using said amplified laser light as laser light to be applied for repair processing.

14. The method for repairing the pattern using the laser according to Claim 13, wherein a pulse width of said laser light to be applied for said repair processing is in a range of 10 picoseconds to 300 picoseconds.

15. The method for repairing the pattern using the laser according to Claim 13, wherein said time delay between said first laser pulse and said second laser pulse is in a range of 0.1 nanoseconds to 10 nanoseconds.

16. The method for repairing the pattern using the laser according to Claim 13, wherein the number of said multi-laser pulses to be sliced from said laser light emitted from said Q-switched mode-locked pulse laser and time to start slicing said multi-laser

pulses to obtain a first pulse are able to be set in an arbitrary manner.

17. A method for repairing a pattern using a laser comprising:

a step of slicing a single laser pulse or multi-laser pulses from a string of pulses making up laser light emitted from a Q-switched mode-locked pulse laser using an optical modulator; and

a step of converting a wavelength of laser light having said sliced single pulse or said sliced multi-laser pulses to produce harmonic light and using said harmonic light as laser light to be applied for repair processing.

18. The method for repairing the pattern using the laser according to Claim 178, wherein a pulse width of said laser light to be applied for said repair processing is in a range of 10 picoseconds to 300 picoseconds.

19. The method for repairing the pattern using the laser according to Claim 17, wherein the number of said multi-laser pulses to be sliced from said laser light emitted from said Q-switched mode-locked pulse laser and time to start slicing said multi-laser pulses to obtain a first pulse are able to be set in an arbitrary manner.

20. A method for repairing a pattern using a laser comprising:

a step of slicing a single laser pulse or multi-laser pulses

from a string of pulses making up laser light emitted from a Q-switched mode-locked pulse laser using an optical modulator;

a step of multiplexing one laser light having a first laser pulse obtained by splitting said single laser pulse or said multi-laser pulses and an other laser light having a second laser pulse obtained by splitting said single laser pulse or said multi-laser pulses and by providing time delay to said second laser pulse into one laser light; and

a step of converting a wavelength of said multiplexed laser light to produce harmonic light and using said harmonic light as laser light to be applied for repair processing.

21. The method for repairing the pattern using the laser according to Claim 20, wherein a pulse width of said laser light to be applied for said repair processing is in a range of 10 picoseconds to 300 picoseconds.

22. The method for repairing the pattern using the laser according to Claim 20, wherein said time delay between said first laser pulse and said second laser pulse is in a range of 0.1 nanoseconds to 10 nanoseconds.

23. The method for repairing the pattern using the laser according to Claim 20, wherein the number of said multi-laser pulses to be sliced from said laser light emitted from said Q-switched mode-locked pulse laser and time to start slicing said multi-laser pulses to obtain a first pulse are able to be set in an arbitrary manner.

24. A method for repairing a pattern using a laser comprising:

a step of slicing a single laser pulse or multi-laser pulses from a string of pulses making up laser light emitted from a Q-switched mode-locked pulse laser using an optical modulator;

a step of directly amplifying laser light having said sliced single laser pulse or said sliced multi-laser pulses using an optical amplifier; and

a step of converting a wavelength of said amplified laser light to produce harmonic light and using said harmonic light as laser light to be applied for repair processing.

25. The method for repairing the pattern using the laser according to Claim 24, wherein a pulse width of said laser light to be applied for said repair processing is in a range of 10 picoseconds to 300 picoseconds.

26. The method for repairing the pattern using the laser according to Claim 24, wherein the number of said multi-laser pulses to be sliced from said laser light emitted from said Q-switched mode-locked pulse laser and time to start slicing said multi-laser pulses to obtain a first pulse are able to be set in an arbitrary manner.

27. A method for repairing a pattern using a laser comprising:

a step of slicing a single laser pulse or multi-laser pulses from a string of pulses making up laser light emitted from a Q-switched mode-locked pulse laser using an optical modulator;

a step of multiplexing one laser light having a first laser pulse obtained by splitting said single laser pulse or said multi-laser pulses and an other laser light having a second laser pulse obtained by splitting said single laser pulse or said multi-laser pulses and by providing time delay to said second laser pulse into one laser light;

a step of directly amplifying said multiplexed laser light by using an optical amplifier; and

a step of converting a wavelength of said amplified laser light to produce harmonic light and using said harmonic light as laser light to be applied for repair processing.

28. The method for repairing the pattern using the laser according to Claim 27, wherein a pulse width of said laser light to be applied for said repair processing is in a range of 10 picoseconds to 300 picoseconds.

29. The method for repairing the pattern using the laser according to Claim 27, wherein said time delay between said first laser pulse and said second laser pulse is in a range of 0.1 nanoseconds to 10 nanoseconds.

30. The method for repairing the pattern using the laser according to Claim 27, wherein the number of said multi-laser pulses to be sliced from said laser light emitted from said Q-switched mode-locked pulse laser and time to start slicing said multi-laser pulses to obtain a first pulse are able to be set in an arbitrary manner.

31. A method for repairing a pattern using a laser comprising:

a step of slicing a single laser pulse or multi-laser pulses from a string of pulses making up laser light emitted from a Q-switched mode-locked pulse laser using an optical modulator;

a step of directly amplifying laser light having said sliced single laser pulse or sliced multi-laser pulse by using an optical amplifier;

a step of multiplexing one amplified laser light having a first laser pulse obtained by splitting said single laser pulse or said multi-laser pulses and an other amplified laser light having a second laser pulse obtained by splitting said single laser pulse or said multi-laser pulses and by providing time delay to said second laser pulse into one laser light;

a step of directly amplifying said multiplexed laser light by using an optical amplifier; and

a step of converting a wavelength of said amplified laser light to produce harmonic light and using said harmonic light as laser light to be applied for repair processing.

32. The method for repairing the pattern using the laser according to Claim 31, wherein a pulse width of said laser light to be applied for said repair processing is in a range of 10 picoseconds to 300 picoseconds.

33. The method for repairing the pattern using the laser according to Claim 31, wherein said time delay between said first laser pulse and said second laser pulse is in a range of 0.1 nanoseconds to 10 nanoseconds.

34. The method for repairing the pattern using the laser according to Claim 31, wherein the number of said multi-laser pulses to be sliced from said laser light emitted from said Q-switched mode-locked pulse laser and time to start slicing said multi-laser pulses to obtain a first pulse are able to be set in an arbitrary manner.

35. A laser-based pattern repair apparatus comprising:

a Q-switched mode-locked pulse laser to emit laser light to be applied for repair processing.

36. The laser-based pattern repair apparatus according to Claim 35, wherein said Q-switched mode-locked pulse laser is made up of a laser resonator having a semiconductor laser pumping unit or a lamp pumping unit, a laser medium including any one of a Nd:YLF laser, Nd:YAG laser and Nd:glass laser, an ultrasonic Q-switching element to produce Q-switched pulses, an ultrasonic mode-locker to produce mode-locked pulses, and etalon plates used to select a longitudinal mode of said laser resonator.

37. The laser-based pattern repair apparatus according to Claim 36, wherein said laser resonator is provided therein with a plurality of etalon plates each having a different thickness and a remote controller for operating said etalon plates, whereby said etalon plates each having said different thickness are changeably inserted into said laser resonator and disposed on a optical axis thereof.

38. The laser-based pattern repair apparatus according

to Claim 37, wherein a variable range of a pulse width of laser light that is able to be obtained by switching for inserting said etalon plates is 10 picoseconds to 300 picoseconds.

39. A laser-based pattern repair apparatus comprising:

a Q-switched mode-locked pulse laser;

an optical modulator to slice a single laser pulse or multi-laser pulses from a string of pulses contained in laser light emitted from said Q-switched mode-locked pulse laser; and

wherein laser light emitted from said optical modulator is used as laser light to be applied for repair processing.

40. The laser-based pattern repair apparatus according to Claim 39, wherein said Q-switched mode-locked pulse laser is made up of a laser resonator having a semiconductor laser pumping unit or a lamp pumping unit, a laser medium including any one of a Nd:YLF laser, Nd:YAG laser and Nd:glass laser, an ultrasonic Q-switching element to produce Q-switched pulses, an ultrasonic mode-locker to produce mode-locked pulses, and etalon plates used to select a longitudinal mode of said laser resonator.

41. The laser-based pattern repair apparatus according to Claim 40, wherein said laser resonator is provided therein with a plurality of etalon plates each having a different thickness and a remote controller for operating said etalon plates, whereby said etalon plates each having said different thickness are changeably inserted into said laser resonator and disposed on a optical axis thereof.

42. The laser-based pattern repair apparatus according to Claim 41, wherein a variable range of a pulse width of laser light that is able to be obtained by switching for inserting said etalon plates is 10 picoseconds to 300 picoseconds.

43. The laser-based pattern repair apparatus according to Claim 39, wherein, when said multi-laser pulses are sliced by said optical modulator from laser light emitted from said Q-switched mode-locked pulse laser, the number of said multi-laser pulses to be sliced and time to start slicing a first pulse are able to be arbitrarily set and to be operated by remote control.

44. A laser-based pattern repair apparatus comprising:

a Q-switched mode-locked pulse laser;

an optical modulator to slice a single laser pulse or multi-laser pulses from a string of pulses contained in laser light emitted from said Q-switched mode-locked pulse laser;

an optical amplifier to directly amplify laser light having said sliced single laser pulse or said sliced multi-laser pulses emitted from said optical modulator; and

wherein laser light emitted from said optical amplifier is used as laser light to be applied for repair processing.

45. The laser-based pattern repair apparatus according to Claim 44, wherein said Q-switched mode-locked pulse laser is made up of a laser resonator having a semiconductor laser pumping unit or a lamp pumping unit, a laser medium including any one of a Nd:YLF laser, Nd:YAG laser and Nd:glass laser, an ultrasonic Q-switching element to produce Q-switched pulses, an ultrasonic

mode-locker to produce mode-locked pulses, and etalon plates used to select a longitudinal mode of said laser resonator.

46. The laser-based pattern repair apparatus according to Claim 45, wherein said laser resonator is provided therein with a plurality of etalon plates each having a different thickness and a remote controller for operating said etalon plates, whereby said etalon plates each having said different thickness are changeably inserted into said laser resonator and disposed on a optical axis thereof.

47. The laser-based pattern repair apparatus according to Claim 46, wherein a variable range of a pulse width of laser light that is able to be obtained by switching for inserting said etalon plates is 10 picoseconds to 300 picoseconds.

48. The laser-based pattern repair apparatus according to Claim 44, wherein, when said multi-laser pulses are sliced by said optical modulator from laser light emitted from said Q-switched mode-locked pulse laser, the number of said multi-laser pulses to be sliced and time to start slicing a first pulse are able to be arbitrarily set and to be operated by remote control.

49. A laser-based pattern repair apparatus comprising:

a Q-switched mode-locked pulse laser;

an optical modulator to slice a single laser pulse or multi-laser pulses from a string of pulses contained in laser light emitted from said Q-switched mode-locked pulse laser;

a laser pulse multiplexing and delaying unit to multiplex

one amplified laser light having a first laser pulse obtained by splitting said single laser pulse or said multi-laser pulses and an other amplified laser light having a second laser pulse obtained by splitting said single laser pulse or said multi-laser pulses and by providing time delay to said second laser pulse into one laser light; and

wherein laser light emitted from said laser pulse multiplexing and delaying unit is used as laser light to be applied for repair processing.

50. The laser-based pattern repair apparatus according to Claim 49, wherein said Q-switched mode-locked pulse laser is made up of a laser resonator having a semiconductor laser pumping unit or a lamp pumping unit, a laser medium including any one of a Nd:YLF laser, Nd:YAG laser and Nd:glass laser, an ultrasonic Q-switching element to produce Q-switched pulses, an ultrasonic mode-locker to produce mode-locked pulses, and etalon plates used to select a longitudinal mode of said laser resonator.

51. The laser-based pattern repair apparatus according to Claim 50, wherein said laser resonator is provided therein with a plurality of etalon plates each having a different thickness and a remote controller for operating said etalon plates, whereby said etalon plates each having said different thickness are changeably inserted into said laser resonator and disposed on a optical axis thereof.

52. The laser-based pattern repair apparatus according to Claim 51, wherein a variable range of a pulse width of laser

light that is able to be obtained by switching for inserting said etalon plates is 10 picoseconds to 300 picoseconds.

53. The laser-based pattern repair apparatus according to Claim 49, wherein, when said multi-laser pulses are sliced by said optical modulator from laser light emitted from said Q-switched mode-locked pulse laser, the number of said multi-laser pulses to be sliced and time to start slicing a first pulse are able to be arbitrarily set and to be operated by remote control.

54. The laser-based pattern repair apparatus according to Claim 49, wherein said laser pulse multiplexing and delaying unit is able to change said delay time within a range of 0.1 nanoseconds to 10 nanoseconds and said change of said delay time is able to be implemented by remote control.

55. The laser-based pattern repair apparatus according to Claim 49, wherein an intensity of a peak power of said first laser pulse and said second laser pulse to be multiplexed and delayed by said laser pulse multiplexing and delaying unit is able to be controlled and calibrated by remote control.

56. A laser-based pattern repair apparatus comprising:

a Q-switched mode-locked pulse laser;

an optical modulator to slice a single laser pulse or multi-laser pulses from a string of pulses contained in laser light emitted from said Q-switched mode-locked pulse laser;

a laser pulse multiplexing and delaying unit to multiplex one amplified laser light having a first laser pulse obtained by

splitting said single laser pulse or said multi-laser pulses and an other amplified laser light having a second laser pulse obtained by splitting said single laser pulse or said multi-laser pulses and by providing time delay to said second laser pulse into one laser light;

an optical amplifier to directly amplify said multiplexed laser light; and

wherein laser light emitted from said optical amplifier is used as laser light to be applied for repair processing.

57. The laser-based pattern repair apparatus according to Claim 56, wherein said Q-switched mode-locked pulse laser is made up of a laser resonator having a semiconductor laser pumping unit or a lamp pumping unit, a laser medium including any one of a Nd:YLF laser, Nd:YAG laser and Nd:glass laser, an ultrasonic Q-switching element to produce Q-switched pulses, an ultrasonic mode-locker to produce mode-locked pulses, and etalon plates used to select a longitudinal mode of said laser resonator.

58. The laser-based pattern repair apparatus according to Claim 57, wherein said laser resonator is provided therein with a plurality of etalon plates each having a different thickness and a remote controller for operating said etalon plates, whereby

said etalon plates each having said different thickness are changeably inserted into said laser resonator and disposed on a optical axis thereof.

59. The laser-based pattern repair apparatus according to Claim 58, wherein a variable range of a pulse width of laser

light that is able to be obtained by switching for inserting said etalon plates is 10 picoseconds to 300 picoseconds.

60. The laser-based pattern repair apparatus according to Claim 56, wherein, when said multi-laser pulses are sliced by said optical modulator from laser light emitted from said Q-switched mode-locked pulse laser, the number of said multi-laser pulses to be sliced and time to start slicing a first pulse are able to be arbitrarily set and to be operated by remote control.

61. The laser-based pattern repair apparatus according to Claim 56, wherein said laser pulse multiplexing and delaying unit is able to change said delay time within a range of 0.1 nanoseconds to 10 nanoseconds and said change of said delay time is able to be implemented by remote control.

62. The laser-based pattern repair apparatus according to Claim 56, wherein an intensity of a peak power of said first laser pulse and said second laser pulse to be multiplexed and delayed by said laser pulse multiplexing and delaying unit is able to be controlled and calibrated by remote control.

63. A laser-based pattern repair apparatus comprising:

a Q-switched mode-locked pulse laser;

an optical modulator to slice a single laser pulse or multi-laser pulses from a string of pulses contained in laser light emitted from said Q-switched mode-locked pulse laser;

a wavelength converting unit to convert a wavelength of laser light having said sliced single pulse or said sliced multi-laser

pulses to produce harmonic light; and

wherein laser light emitted from said wavelength converting unit is used as laser light to be applied for repair processing.

64. The laser-based pattern repair apparatus according to Claim 63, wherein said Q-switched mode-locked pulse laser is made up of a laser resonator having a semiconductor laser pumping unit or a lamp pumping unit, a laser medium including any one of a Nd:YLF laser, Nd:YAG laser and Nd:glass laser, an ultrasonic Q-switching element to produce Q-switched pulses, an ultrasonic mode-locker to produce mode-locked pulses, and etalon plates used to select a longitudinal mode of said laser resonator.

65. The laser-based pattern repair apparatus according to Claim 64, wherein said laser resonator is provided therein with a plurality of etalon plates each having a different thickness and a remote controller for operating said etalon plates, whereby said etalon plates each having said different thickness are changeably inserted into said laser resonator and disposed on a optical axis thereof.

66. The laser-based pattern repair apparatus according to Claim 65, wherein a variable range of a pulse width of laser light that is able to be obtained by switching for inserting said etalon plates is 10 picoseconds to 300 picoseconds.

67. The laser-based pattern repair apparatus according to Claim 63, wherein, when said multi-laser pulses are sliced by said optical modulator from laser light emitted from said

Q-switched mode-locked pulse laser, the number of said multi-laser pulses to be sliced and time to start slicing a first pulse are able to be arbitrarily set and to be operated by remote control.

68. The laser-based pattern repair apparatus according to Claim 63, wherein said wavelength converting unit is a wavelength converting element using a nonlinear optical crystal to emit a third harmonic, fourth harmonic, and fifth harmonic each having a wavelength of not more than 360 nm.

69. A laser-based pattern repair apparatus comprising:

a Q-switched mode-locked pulse laser;

an optical modulator to slice a single laser pulse or multi-laser pulses from a string of pulses contained in laser light emitted from said Q-switched mode-locked pulse laser;

a laser pulse multiplexing and delaying unit to multiplex one laser light having a first laser pulse obtained by splitting said single laser pulse or said multi-laser pulses and an other laser light having a second laser pulse obtained by splitting said single laser pulse or said multi-laser pulses and by providing time delay to said second laser pulse into one laser light;

a wavelength converting unit to convert a wavelength of said multiplexed laser light to produce harmonic light; and

wherein laser light emitted from said wavelength converting unit is used as laser light to be applied for repair processing.

70. The laser-based pattern repair apparatus according to Claim 69, wherein said Q-switched mode-locked pulse laser is made up of a laser resonator having a semiconductor laser pumping

unit or a lamp pumping unit, a laser medium including any one of a Nd:YLF laser, Nd:YAG laser and Nd:glass laser, an ultrasonic Q-switching element to produce Q-switched pulses, an ultrasonic mode-locker to produce mode-locked pulses, and etalon plates used to select a longitudinal mode of said laser resonator.

71. The laser-based pattern repair apparatus according to Claim 70, wherein said laser resonator is provided therein with a plurality of etalon plates each having a different thickness and a remote controller for operating said etalon plates, whereby said etalon plates each having said different thickness are changeably inserted into said laser resonator and disposed on a optical axis thereof.

72. The laser-based pattern repair apparatus according to Claim 71, wherein a variable range of a pulse width of laser light that is able to be obtained by switching for inserting said etalon plates is 10 picoseconds to 300 picoseconds.

73. The laser-based pattern repair apparatus according to Claim 69, wherein, when said multi-laser pulses are sliced by said optical modulator from laser light emitted from said Q-switched mode-locked pulse laser, the number of said multi-laser pulses to be sliced and time to start slicing a first pulse are able to be arbitrarily set and to be operated by remote control.

74. The laser-based pattern repair apparatus according to Claim 69, wherein said laser pulse multiplexing and delaying unit is able to change said delay time within a range of 0.1

nanoseconds to 10 nanoseconds and said change of said delay time is able to be implemented by remote control.

75. The laser-based pattern repair apparatus according to Claim 69, wherein an intensity of a peak power of said first laser pulse and said second laser pulse to be multiplexed and delayed by said laser pulse multiplexing and delaying unit is able to be controlled and calibrated by remote control.

76. The laser-based pattern repair apparatus according to Claim 69, wherein said wavelength converting unit is a wavelength converting element using a nonlinear optical crystal to emit a third harmonic, fourth harmonic, and fifth harmonic each having a wavelength of not more than 360 nm.

77. A laser-based pattern repair apparatus comprising:

a Q-switched mode-locked pulse laser;

an optical modulator to slice a single laser pulse or multi-laser pulses from a string of pulses contained in laser light emitted from said Q-switched mode-locked pulse laser;

an optical amplifier to directly amplify said laser light having said sliced single laser pulse or said sliced multi-laser pulses;

a wavelength converting unit to convert a wavelength of laser light emitted from said optical amplifier to produce harmonic light; and

wherein laser light emitted from said wavelength converting unit is used as laser light to be applied for repair processing.

78. The laser-based pattern repair apparatus according to Claim 77, wherein said Q-switched mode-locked pulse laser is made up of a laser resonator having a semiconductor laser pumping unit or a lamp pumping unit, a laser medium including any one of a Nd:YLF laser, Nd:YAG laser and Nd:glass laser, an ultrasonic Q-switching element to produce Q-switched pulses, an ultrasonic mode-locker to produce mode-locked pulses, and etalon plates used to select a longitudinal mode of said laser resonator.

79. The laser-based pattern repair apparatus according to Claim 78, wherein said laser resonator is provided therein with a plurality of etalon plates each having a different thickness and a remote controller for operating said etalon plates, whereby said etalon plates each having said different thickness are changeably inserted into said laser resonator and disposed on a optical axis thereof.

80. The laser-based pattern repair apparatus according to Claim 79, wherein a variable range of a pulse width of laser light that is able to be obtained by switching for inserting said etalon plates is 10 picoseconds to 300 picoseconds.

81. The laser-based pattern repair apparatus according to Claim 77, wherein, when said multi-laser pulses are sliced by said optical modulator from laser light emitted from said Q-switched mode-locked pulse laser, the number of said multi-laser pulses to be sliced and time to start slicing a first pulse are able to be arbitrarily set and to be operated by remote control.

82. The laser-based pattern repair apparatus according to Claim 77, wherein said wavelength converting unit is a wavelength converting element using a nonlinear optical crystal to emit a third harmonic, fourth harmonic, and fifth harmonic each having a wavelength of not more than 360 nm.

83. A laser-based pattern repair apparatus comprising:

a Q-switched mode-locked pulse laser;

an optical modulator to slice a single laser pulse or multi-laser pulses from a string of pulses contained in laser light emitted from said Q-switched mode-locked pulse laser;

a laser pulse multiplexing and delaying unit to multiplex one laser light having a first laser pulse obtained by splitting said sliced single laser pulse or said sliced multi-laser pulses and an other laser light having a second laser pulse obtained by splitting said sliced single laser pulse or said sliced multi-laser pulses and by providing time delay to said second laser pulse into one laser light;

an optical amplifier to directly amplify said multiplexed laser light;

a wavelength converting unit to convert a wavelength of laser light emitted from said optical amplifier to produce harmonic light; and

wherein laser light emitted from said wavelength converting unit is used as laser light to be applied for repair processing.

84. The laser-based pattern repair apparatus according to Claim 83, wherein said Q-switched mode-locked pulse laser is made up of a laser resonator having a semiconductor laser pumping

unit or a lamp pumping unit, a laser medium including any one of a Nd:YLF laser, Nd:YAG laser and Nd:glass laser, an ultrasonic Q-switching element to produce Q-switched pulses, an ultrasonic mode-locker to produce mode-locked pulses, and etalon plates used to select a longitudinal mode of said laser resonator.

85. The laser-based pattern repair apparatus according to Claim 84, wherein said laser resonator is provided therein with a plurality of etalon plates each having a different thickness and a remote controller for operating said etalon plates, whereby said etalon plates each having said different thickness are changeably inserted into said laser resonator and disposed on a optical axis thereof.

86. The laser-based pattern repair apparatus according to Claim 85, wherein a variable range of a pulse width of laser light that is able to be obtained by switching for inserting said etalon plates is 10 picoseconds to 300 picoseconds.

87. The laser-based pattern repair apparatus according to Claim 83, wherein, when said multi-laser pulses are sliced by said optical modulator from laser light emitted from said Q-switched mode-locked pulse laser, the number of said multi-laser pulses to be sliced and time to start slicing a first pulse are able to be arbitrarily set and to be operated by remote control.

88. The laser-based pattern repair apparatus according to Claim 83, wherein said laser pulse multiplexing and delaying unit is able to change said delay time within a range of 0.1

nanoseconds to 10 nanoseconds and said change of said delay time is able to be implemented by remote control.

89. The laser-based pattern repair apparatus according to Claim 83, wherein an intensity of a peak power of said first laser pulse and said second laser pulse to be multiplexed and delayed by said laser pulse multiplexing and delaying unit is able to be controlled and calibrated by remote control.

90. The laser-based pattern repair apparatus according to Claim 83, wherein said wavelength converting unit is a wavelength converting element using a nonlinear optical crystal to emit a third harmonic, fourth harmonic, and fifth harmonic each having a wavelength of not more than 360 nm.

91. A laser-based pattern repair apparatus comprising:

a Q-switched mode-locked pulse laser;

an optical modulator to slice a single laser pulse or multi-laser pulses from a string of pulses contained in laser light emitted from said Q-switched mode-locked pulse laser;

a laser pulse multiplexing, delaying, and amplifying unit to multiplex one laser light having a first laser pulse obtained by splitting said sliced single laser pulse or said sliced multi-laser pulses and an other amplified laser light having a second laser pulse obtained by splitting said sliced single laser pulse or said sliced multi-laser pulses and by providing time delay to said second laser pulse into one laser light and, at the same time, to directly amplify laser light having said first laser pulse by a double pass method in which said laser light is transmitted

twice through an optical amplifying medium in a reciprocating manner and to directly amplify laser light having said second laser pulse by a single pass method in which said laser light is transmitted once through said optical amplifying medium;

a wavelength converting unit to convert a wavelength of laser light emitted from said laser pulse multiplexing, delaying, and amplifying unit to produce harmonic light; and

wherein laser light emitted from said wavelength converting unit is used as laser light to be applied for repair processing.

92. The laser-based pattern repair apparatus according to Claim 91, wherein said Q-switched mode-locked pulse laser is made up of a laser resonator having a semiconductor laser pumping unit or a lamp pumping unit, a laser medium including any one of a Nd:YLF laser, Nd:YAG laser and Nd:glass laser, an ultrasonic Q-switching element to produce Q-switched pulses, an ultrasonic mode-locker to produce mode-locked pulses, and etalon plates used to select a longitudinal mode of said laser resonator.

93. The laser-based pattern repair apparatus according to Claim 92, wherein said laser resonator is provided therein with a plurality of etalon plates each having a different thickness and a remote controller for operating said etalon plates, whereby said etalon plates each having said different thickness are changeably inserted into said laser resonator and disposed on a optical axis thereof.

94. The laser-based pattern repair apparatus according to Claim 93, wherein a variable range of a pulse width of laser

light that is able to be obtained by switching for inserting said etalon plates is 10 picoseconds to 300 picoseconds.

95. The laser-based pattern repair apparatus according to Claim 91, wherein, when said multi-laser pulses are sliced by said optical modulator from laser light emitted from said Q-switched mode-locked pulse laser, the number of said multi-laser pulses to be sliced and time to start slicing a first pulse are able to be arbitrarily set and to be operated by remote control.

96. The laser-based pattern repair apparatus according to Claim 91, wherein said laser pulse multiplexing, delaying, and amplifying unit is able to change said delay time within a range of 0.1 nanoseconds to 10 nanoseconds and said change of said delay time is able to be implemented by remote control.

97. The laser-based pattern repair apparatus according to Claim 91, wherein an intensity of a peak power of said first laser pulse and said second laser pulse to be multiplexed and delayed by said laser pulse multiplexing and delaying unit; or multiplexed, delayed, and amplified by said laser pulse multiplexing, delaying, and amplifying unit is able to be controlled and calibrated by remote control.

98. The laser-based pattern repair apparatus according to Claim 91, wherein said wavelength converting unit is a wavelength converting element using a nonlinear optical crystal to emit a third harmonic, fourth harmonic, and fifth harmonic each having a wavelength of not more than 360 nm.